Mini Examination #2 Limits and Derivatives Name _____

I. Multiple Choice

_____ 1. Determine the differential *dy* of $y = 3x^5 - 5x^2 + 6$

(A) $15x^4 - 10x$ (B) $(15x^4 - 10x + 1)dx$ (C) $15x - 10$

(D) $(15x^4 - 10x)dx$ (E) None of the above

_____ 2. What is the average rate of change of $f(x) = x^3 - 3x^2 + x - 1$ over [-1, 4]?

(A) $\frac{13}{5}$ (B) 3 (C) 5 (D) 10 (E) 25

_____ 3. What is the slope of the curve defined by $3x^2 + 2xy + 6y^2 - 3x - 8y = 0$ at the point (1, 1) ?

(A) $\frac{-5}{6}$ (B) $\frac{-1}{2}$ (C) 0 (D) $\frac{1}{2}$ (E) It is undefined.

_____ 4. $\lim_{x\to\infty}\left(\frac{5x^2 + 7x - 3}{2 + 3x - 11x^2}\right) =$

(A) $-\frac{3}{2}$ (B) $-\frac{5}{11}$ (C) 0 (D) $\frac{5}{11}$ (E) It is nonexistent

_____ 5. The water level in a cylindrical barrel is falling at a rate of one inch per minute. If the radius of the barrel is ten inches, what is the rate that water is leaving the Barrel (in cubic inches per minute) when the Volume is $500\pi$ cubic inches?

(A) 1 (B) $\pi$ (C) $100\pi$ (D) $200\pi$ (E) $500\pi$

_____ 6. $\frac{d}{dx}\left(e^{\sin 2x}\right) =$

(A) $-\cos(2x)e^{\sin(2x)}$
(B) $\cos(2x)e^{\sin(2x)}$
(C) $2e^{\sin(2x)}$
(D) $2\cos(2x)e^{\sin(2x)}$
(E) $-2\cos(2x)e^{\sin(2x)}$

_____ 7. The equation of the line tangent to $y = \sin x + 2\cos x$ at $\left(\frac{\pi}{2}, 1\right)$ is

(A) $2x - y = \pi - 1$
(B) $2x + y = \pi + 1$
(C) $2x - 2y = 2 - \pi$
(D) $4x + 2y = 2 - \pi$
(E) None of the above

_____ 8. If $f(x) = \begin{cases} e^x, & x < \ln 2 \\ 2, & x \geq \ln 2 \end{cases}$
Then $\lim_{x \to \ln 2} f(x) =$

(A) $\frac{1}{2}$ (B) $\ln 2$ (C) 2 (D) $e^2$ (E) The limit doe not exist

_____ 9. If $f(x) = \tan^2 x + \sin x$, then $f'\left(\frac{\pi}{4}\right) =$

(A) $\frac{4+\sqrt{2}}{2}$ (B) $\frac{4-\sqrt{2}}{2}$ (C) $\frac{2+\sqrt{2}}{2}$

(D) $\frac{8-\sqrt{2}}{2}$ (E) $\frac{8+\sqrt{2}}{2}$

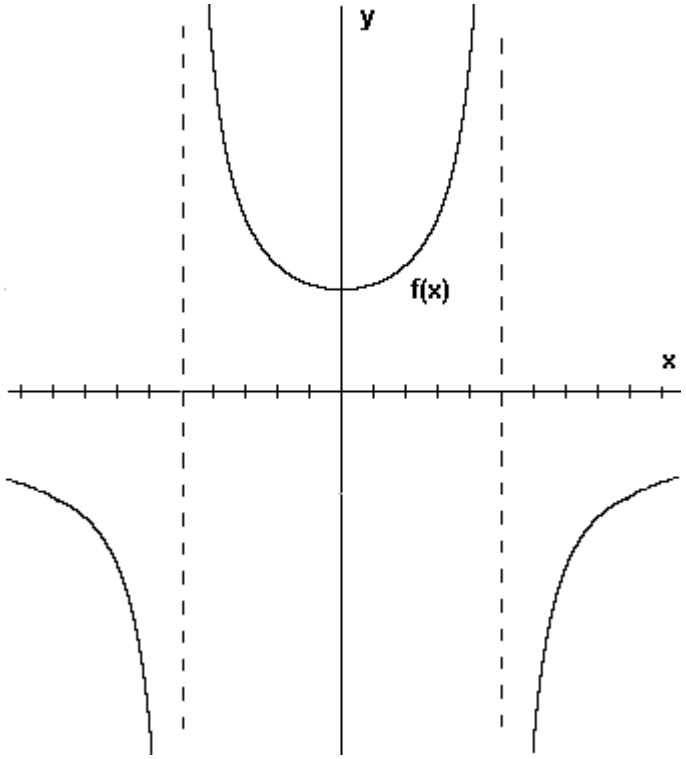
II. Free Response

SHOW ALL WORK ON YOUR OWN PAPER. Do NOT write on this test paper.

10. Determine the $35^{th}$ derivative of $y = \sin 2x$.

11. Determine the second derivative of $y = \sec x$.

12. Draw the graph of the ***derivative*** of the function below:




13. Given the parametric equations: $y = 5t^2 - 3$, $x = t + 2$

Determine the derivative $\frac{dy}{dx}$

14. Evaluate the limit: $\lim_{x \to 0} \frac{3\sin 6x}{x} =$

15. Given $f(1)=1,$ and $f'(1)=3,$

Evaluate $\left.\frac{d}{dx}\left(\sqrt{f(x)}\right)\right|_{x=1}$

16. Determine the value of $k$ if the graphs of $y=-2x-1$ and $y=x^2+2x+k$ are tangent to each other at a point in the second quadrant.

17. State and prove the derivative formula for $y=\cos x$.

18. Determine the derivative of $h(x)=3x^2\tan^3(4x)$.
SHOW ALL STEPS!